

EQUIPMENT AND CARE OF EQUIPMENT

In the past thirty years more than fifty companies have produced hundreds of different kinds of apparatus to help you breathe more easily and effectively. This chapter will discuss in simple terms how to use and take care of the therapeutic equipment your doctor has prescribed for you.

Even if you are not using any equipment, it is still a good idea to know the kinds that are available and how they work. If you are using breathing equipment, you will see why the equipment, by itself, cannot be expected to improve your condition. A good outlook on life combined with proper exercise, diet, and so forth, is essential to becoming healthy again and then staying healthy.

Metered-dose Inhaler

This type of nebulizer is considered one of the best and most simple methods of delivering medication. It delivers a measured amount of medication with each “puff.” Various types and brands of medication may be used in these inhalers. Some are prescribed to relieve bronchospasm, decrease the feeling of shortness of breath, and increase the diameter of the airways; others are used to help prevent bronchial attacks before they occur. With this in mind, be sure you know what the exact purpose is of your inhaler and how often you can use it safely.

Instructions For Use Of The Metered-dose Inhalers

There will be two sets of instructions for metered-dose inhalers. The first set of instructions will not use an additional tube spacer. A tube spacer is a new extension tube technique which appears to significantly improve usage of metered-dose inhalers. Also available is an Aerochamber™

aerosol inhaler by Monaghan which may be used with virtually all metered-dose inhalers. These 2 devices help in two ways. First, throat and tongue irritation is reduced because the larger droplets, which cannot enter the airways anyway, stick to it. Second, it serves as a reservoir for the medication so that exact timing during inhalation is not needed. Check with your drug store or oxygen equipment company for information.

Metered-dose Inhaler: Technique I

- Assemble inhaler.
- Shake well, if indicated.
- Place the mouthpiece about one inch in front of your wide open mouth. (Figure 1)



Figure 1

This helps to prevent medication from impacting to the back of the throat and more air to be inhaled carrying the medication deeper into the airways. Note: If it is too difficult for you to direct the spray, you may place the mouth piece up to your mouth trying not to close the lips completely around the mouthpiece. (Figure 2) Your upper lip may be used as a guide to help prevent the mouthpiece from entering too far into the mouth. Remember, the wide open mouth allows more air to enter the lungs carrying the medication deeper into the airways.

- Exhale gently through pursed-lips taking care not to force all the air out. Note: A forced exhalation may close air passages which need medication.



Figure 2

- While inhaling slowly, press down firmly on the cartridge to release the medication. Note: Rapid inhalations tend to cause more of the medication to impact at the back of the throat.
- Hold your breath for as long as comfortable, approximately 4 to 10 seconds. This will allow the medication to settle on

the airways.

- Exhale very slowly through pursed-lips.
- Repeat only as prescribed. Because of the high concentration of medication in the metered-dose inhaler, excessive use may cause dangerous side effects.
- Clean the plastic mouth piece regularly.

Metered-dose Inhaler: Technique II

- Assemble inhaler using the tube spacer or Aerochamber™. Note: Some medications have a built in spacer; e.g., Azmacort inhaler. Note: Corrugated tubing interspaced with smooth tubing for attachment to the mouthpiece may be used. The tubing, however, does not fit all inhalers easily. Note: You may need to clip one end of the tubing and insert it into the mouthpiece. Secure the tubing with tape. Home oxygen and equipment companies may be able to supply you with this tubing. The corrugated tubing should be in lengths of 4 to 6 inches. Note: Some pulmonary function laboratories use longer tubing; however, for convenience of storage in the pocket or purse, 4 to 6 inches is sufficient.

- Shake well, if indicated.
- Exhale gently through pursed-lips taking care not to force all the air out. Note: A forced exhalation may close air passages which need medication.
- Place the tube spacer attached to the inhaler between lips. Do not place deeply into the mouth. (Figure 3)
- While inhaling slowly, press down firmly on the cartridge to release the medication. Note: Rapid inhalations tend to cause more of the medication to impact at the back of the throat.
- Hold your breath for as long as is comfortable, approximately 4 to 10 seconds. This will allow the medication to settle on the air ways.



Figure 3

- Exhale very slowly through pursed-lips.

- Repeat only as prescribed. Because of the high concentration of medication in the metered-dose inhaler, excessive use may cause dangerous side effects.
- Clean the tube spacer or Aerochamber™ regularly.

How To Tell If Metered-dose Inhaler Is Full

- Place the cartridge in a container of water.
- Observe its position according to the diagram. The closer the cartridge gets to the top, the less medication is inside.



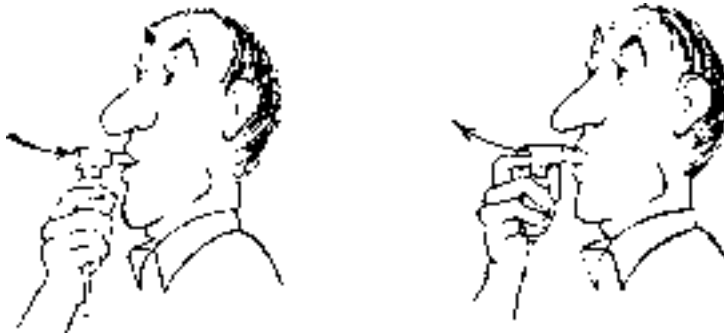
Aerosol Treatments

There are many, many types of equipment available for administering aerosol treatments. Basically, they all use an electric compressor, a nebulizer to aerosolize the medication, a small-bore tubing to connect the compressor to the nebulizer, and either a mouthpiece or a face mask.

Instructions For Administering An Aerosol Treatment

- Plug the compressor into a wall outlet.
- Wash hands.
- Assemble equipment. Use the small-bore tubing to connect the compressor to the nebulizer.
- Fill the nebulizer with the prescribed amount of medication. This usually amounts to about 1/2 ml (5-6 drops) of a bronchodilator in normal saline solution. (Instructions for preparing normal saline solution are given at the end of the chapter.)

- Attach the mouthpiece or face mask to the nebulizer.
- Turn the compressor on.
- Sit up in a relaxed manner. This allows for the best distribution of the medication in the lungs.
- Take slow, deep breaths through your mouth, pausing at the end of each breath. This allows the medication to settle on the airways.
- Exhale slowly while contracting/pulling the stomach inward. If you are using the face mask, it is easy to exhale through pursed-lips. If you are using the mouthpiece, you may either take the mouthpiece out of your mouth and exhale through pursed-lips, place the mouthpiece only to the lips, parting the lips during inhalation and pursing the lips during exhalation, or partially cover the exhalation port with one or two fingers leaving a small opening to mimic pursed-lip breathing. Remove finger(s) during inhalation. (See illustrations.)



These techniques help you to exhale more slowly and lessen the possibility of trapping air in the lungs. (See page 42 to understand how dangerous trapped air may be in the lungs.) Continue until all the medication is gone using proper breathing with every breath. Don't get lazy! Think about what you are doing.

- Cough periodically, using the proper technique. (Chapter 5) Do this during and after the treatment.
- If you are congested or especially dry, add additional

normal saline to the nebulizer and breathe for 10 to 20 more minutes. This adds more moisture to the bronchial tubes making the mucus more “slippery” and allowing it to be more easily expectorated.

- Clean and disinfect your equipment at the end of the last treatment each day using one of the proper cleaning instructions listed toward the end of the chapter. Note: If moisture collects in the small bore tubing, turn the machine on to blow the tubing dry.

Ultrasonic Nebulization Treatment (USN)

Ultrasonic nebulization is another form of aerosol therapy. It is quite expensive and is not usually prescribed unless your physician feels your other aerosol therapy needs to be supplemented. Aerosol in this form is a finer mist than conventional aerosol therapy, creating a misting, geyser effect which you inhale into the lungs in order to aid in the removal of secretions.



Your physician may prescribe ultrasonic nebulization treatments. The sequence of therapy may first be inhalation of a bronchodilator medication using one of the following: metered-dose inhaler, aerosol, or IPPB. This is followed by ultrasonic nebulization and may be taken with postural drainage and percussion. (Chapter 5)

There are many ultrasonic nebulizers on the market. It is important that you rent or purchase the proper unit as prescribed by your physician. There is the conventional ultrasonic nebulizer which uses sterile water or normal saline, a mini-ultrasonic nebulizer usually used to deliver bronchodilator medications and an ultrasonic nebulizer used as a room humidifier.

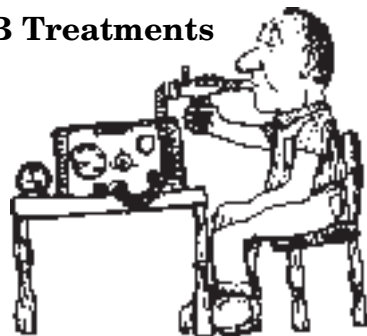
Instructions For Administering An Ultrasonic Nebulization Treatment

- Read the instruction manual accompanying your unit and fully understand it before use.
- Plug the unit into a wall outlet.
- Wash hands.
- Assemble equipment according to manufacturer's instructions.
- Attach the mouthpiece or face mask to the unit.
- Sit up in a relaxed manner or use the various postural drainage positions if your physician, nurse, or therapist has instructed you to do so. (The corrugated tubing which delivers the mist via the mask or mouthpiece should be of adequate length to enable the person to lie in postural drainage positions. See Chapter 5.)
- Inhale slowly through the mouth. Pause.
- Exhale slowly while slightly contracting the stomach. If you are using the face mask, always exhale through pursed-lips.
- If you are using the mouthpiece, you may either take the mouthpiece out of your mouth and exhale through pursed-lips or place the mouthpiece only to the lips, parting the lips during inhalation and pursing the lips during exhalation. These techniques help you to exhale more slowly and lessen the possibility to trapping air in the lungs. (See page 42 to understand how dangerous trapped air may be in the lungs.)
- If a sudden coughing episode should occur while inhaling this finer aerosol, try to control the cough using controlled coughing. (Chapter 5) This coughing episode may be caused from the mucus accumulating more quickly in the upper airways or the aerosol may be too dense, causing you to cough. You may regulate the flow of mist from low to high.
- An average time for an ultrasonic treatment may be from 15 to 45 minutes. Follow your physician's recommendations.
- Clean and disinfect your equipment at the end of the last treatment each day using one of the proper cleaning instructions listed toward the end of the chapter.

Intermittent Positive Pressure Breathing (IPPB)

Many companies manufacture machines to give intermittent positive pressure breathing (IPPB). This is a procedure which may be prescribed by your doctor. It is simply a means of delivering an aerosol, usually a bronchodilator, to the lungs under a prescribed amount of pressure. As you begin to inhale, the machine triggers on automatically and the aerosol is carried from the machine's nebulizer into the airways of the lungs by the flow of air under pressure. When the pressure setting on the machine is equal to the pressure in the lungs, the flow of air stops automatically in order for you to exhale. Your doctor will order the frequency of treatments per day, medication and, depending upon the equipment, the type of gas (oxygen or air) to power the machine or electricity to power the machine. When the technician from the equipment company arrives to deliver your machine, be sure he explains its proper use and that you understand clearly how to use it before he leaves. This is an absolute necessity for, once you are on your own, equipment has a way of seeming much more complicated.

Instructions For Use Of IPPB Treatments



- Plug the equipment into a wall outlet if powered by electricity or into a proper gas outlet if powered by gas.
- Wash hands.

- Assemble equipment.
- Fill the nebulizer with the prescribed amount of medication. If the prescription is 1/2 ml of a prescribed bronchodilator, it is approximately 5-6 drops. A normal saline solution is also added. (Instructions for preparing normal saline are given at the end of this chapter.)
- Make certain all connections fit securely. If there is a leak in the system, the pressure will not build up and the machine will not cut off when it should.
- Turn power on.
- Be certain pressure and flow rate is set appropriately. Too much pressure could be harmful. The flow rate determines the velocity at which the aerosol will enter the lungs. Sit up in a relaxed manner. This allows for better distribution of the medication into the lungs.
- Inhale slowly through the mouthpiece allowing the stomach to come out and the lungs to fill with air. The machine will automatically cut off when the pressure setting on the machine is equal to the pressure in the lungs.
- Pause for a moment. This allows the medication to settle on the airways.
- Take the mouthpiece out of your mouth and exhale slowly through pursed-lips while contracting/pulling the stomach inward. This helps you to exhale more slowly and completely, lessening the possibility of trapping air in the lungs. (See page 42 to understand how dangerous trapped air may be in the lungs.)
- Continue until all the medication is gone using proper breathing with every breath. Don't get lazy! Think about what you are doing. If you experience light-headedness during treatments, it could be that you are hyperventilating, that is, breathing too deeply or too quickly.
- Cough periodically throughout the treatment and at the end of the treatment using the proper coughing technique. (Chapter 5) If you are congested or especially dry, add additional normal saline to the nebulizer and breathe for 10 to 20 more minutes. This adds more moisture to the bronchial tubes making the mucus more "slippery" and allowing

it to be more easily expectorated.

- Clean and disinfect your equipment at the end of the last treatment each day using one of the cleaning methods toward the end of this chapter.

Nebulizers: Continuous Type

Nebulizers may be used for a continuous source of moisture. These continuous forms of aerosol have a larger reservoir (250 to 500 ml) than the standard nebulizers for routine aerosol therapy (6 to 15 ml).

An individual with a tracheostomy (surgical opening into the trachea - main airway into the lungs) would normally require this method of continuous moisture into the airways. Because the person's upper airways (nose and mouth) are bypassed, thus, preventing air from being humidified in the normal way, another source of moisture via the nebulizer becomes necessary. In addition, nebulizers may be heated for more humidification of the airways.

Continuous nebulizers, tubing, trach-adaptors or face masks, if used by a person without a tracheostomy, must be scrupulously cleaned and maintained according to manufacturer's recommendation and disinfected daily using one of the following cleaning methods.



Proper Cleaning Of Respiratory Equipment

There are many types of respiratory equipment. Whichever you use, you must be certain it is immaculately clean before use. Germs and disease are very real problems. If you do not keep the equipment clean and disinfected you will re-infect yourself every time you use it. Equipment can become contaminated in just 24 hours through the growth of

your own germs! **It is better to use no equipment at all than to use dirty equipment!**

It is most important to get debris off the mouthpiece, nebulizer, manifold, etc. This is done by scrubbing them in hot, sudsy water. If you don't remove the debris first, no matter how potent the disinfectant you use, it won't be able to do the job since disinfection occurs only when the disinfectant is in contact with the germs. Germs that have been "hiding" under a clump of debris are free to continue their growth.

One of three ways of disinfecting may be chosen: chemical agents, ordinary vinegar (acetic acid), or heat. Whichever you prefer, do this first:

Preliminary Cleaning (all methods)

- Disassemble equipment.
- Wash equipment thoroughly in mild detergent, such as Joy, Lux or Ivory and rinse well. Reserve brushes and bowls for equipment cleaning only.

Method I - Chemicals

Chemicals packaged especially for disinfecting equipment are becoming more practical, efficient and economical. They are more reliable than a vinegar solution and are, in the long run, less expensive than vinegar since they may be stored up to 2 weeks.

- Follow instructions for preliminary cleaning, above.
- Follow package instructions for preparing solution and soaking.
- Rinse well with distilled or boiled water. Tap water may be used if you are certain your water supply is safe. Shake off excess water. You may swing tubing around in the air.
- Place the equipment parts on clean, dry paper towels to thoroughly air dry. Never wipe dry or use hair dryers or

blowers to speed drying.

- Store dry equipment in clean, new plastic bags and seal them tightly.

Method II - Vinegar (acetic acid)

Note: Many physicians feel vinegar is not an adequate disinfectant.

- Prepare enough solution to cover the equipment according to this formula: 3 parts white vinegar to 2 parts distilled or boiled water. Tap water may be used if you are certain your water supply is safe. Note well: It is preferable to use a fresh vinegar solution daily. If you do store it, keep it covered and store no longer than 2 days. The problem with using acetic acid is that, like any acid, it will eventually become chemically dissociated; that is, the acid component breaks down and then you can not know how effective it is as a cleaning agent. For vinegar to disinfect properly, it must be in a certain pH range (pH is a scale for measuring acidity and alkalinity.) If the acid level of the vinegar is not high enough, you may actually be creating a medium for the growth of germs. This is why you must not store a vinegar solution longer than 2 days.
- Follow instructions for preliminary cleaning, above.
- Rinse, dry and store equipment as described in the first method.

Method III - Heat (immersion in hot water)

- Follow instructions for preliminary cleaning.
- Note well: Certain types of equipment may be damaged by extreme temperatures.
- Soak equipment parts in very hot water (180° F) for 20 minutes.
- Dry and store as described in Method I.

Proper Care And Cleaning Of Room Humidifiers And Vaporizers

- Read the instruction manual accompanying your unit and fully understand it before use. (See Chapter 12, page 142)
- Be certain unit is unplugged from electrical outlet.
- Clean reservoir daily with hot, sudsy water. Rinse well.
- Add clean tap water to fill line.
- Please note: If your unit does not steam or steams too slowly, add 1/8 to 1/4 teaspoon of baking soda to the reservoir. This will increase the mineral content of the water, thus, improving conductivity which is necessary for proper performance.
- At least once a week, disassemble equipment and clean well. Reassemble equipment and run a mild 2% vinegar solution through the equipment for 20 to 30 minutes. (A vinegar solution is 1 1/2 Tbsp. white vinegar in 1 quart water.) Do not inhale the mist. You may wish to cover the vaporizer with a towel or cloth. (According to most instructions, full strength vinegar may be used to soak off mineral deposits which may build up on the electrodes, especially if the water is hard or chemically treated. However, the 2% vinegar solution is to be vaporized through the fully assembled unit for the purpose of maintaining as clean a unit as possible.)
- Rinse well with water and proceed to vaporize water through the unit for a few minutes. Discard water.
- Air dry until ready for use. Never store equipment unless it is completely dry.
- When ready to use, add clean tap water to fill line.

Making Normal Saline At Home

Normal saline can be safely and economically made at home using basic skills and supplies.

Supplies:

- Two-quart pan.
- Measuring spoon, 1 tsp.
- Salt (common table salt).
- Distilled or bottled water.
- One-quart jar with lid.

Steps To Making Normal Saline:

- Bring one quart of water to a boil.
- Add one teaspoon salt, stir.
- Continue to simmer for five minutes.
- Allow to cool slightly.
- Pour saline solution into clean jar. Put the lid on loosely and allow to cool to room temperature. Tighten lid. Store in the refrigerator.

Other Considerations:

- Use a glass jar which has been washed thoroughly, rinsed well and then rinsed well again with boiling water (a pair of tongs allows you to easily handle the jar when rinsing with the hot water); or, put it through the dishwasher. Once cleaned, do not allow anything to touch the insides of the jar or lid until ready to fill.
- Each week, discard saline solution and make a fresh solution.
- Pour saline solution directly into the medication cup of your breathing apparatus. Never pour any solution back into the jar or put any measuring device, such as a teaspoon or eyedropper, into the solution.